

РЕСТРУКТУРИЗАЦИЯ РЫНКА ЭНЕРГОСНАБЖЕНИЯ КАК БАЗОВЫЙ ВЕКТОР РЕФОРМИРОВАНИЯ ЭНЕРГЕТИКИ РАЗВИВАЮЩИХСЯ СТРАН: КЕЙС РЕСПУБЛИКИ БОТСВАНА

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В статье раскрывается важность реструктуризации рынка энергоресурсов в развивающихся странах на примере Республики Ботсвана – страны, не осуществившей отраслевых реформ для повышения эффективности энергетического сектора. Раскрываются различные уровни и формы рыночных структур в сфере энергетики и проводятся сопоставления с другими развивающимися странами мира с учетом конкретных особенностей развития, с которыми сталкивается Ботсвана. В работе обосновано, что реструктуризация энергетического рынка должна стать ключевым приоритетом в реализации механизмов повышения уровня энергетической безопасности в стране. Показано, что автономное и транспарентное регулирование энергетического сектора выступает в качестве одного из базовых факторов, способствующих успешному осуществлению реструктуризации рынка энергоснабжения.

Ключевые слова: реструктуризация рынка энергоснабжения; реформы энергетического сектора; развивающиеся страны; энергетический сектор Ботсваны; энергетическая безопасность.

RESTRUCTURING OF THE ELECTRICITY SUPPLY MARKET, AS A BASIC VECTOR OF ELECTRICITY SECTOR REFORM IN DEVELOPING COUNTRIES: BOTSWANA CASE STUDY

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The article substantiates the importance of restructuring the energy supply market in developing countries, in the example of Botswana as a country that has not implemented any sectorial reforms for improving the performance of its energy sector. The various levels and forms of market structures are discussed and comparisons are made with other developing countries around the world, taking into account the country specific challenges faced by Botswana. The article suggests that restructuring of the

sector should be a key priority in the implementation of mechanisms for improving the level of energy security in the country. The significance of energy sector regulation that is autonomous and transparent is also discussed as a key factor for facilitating the successful implementation of energy supply market restructuring.

Keywords: restructuring energy supply market; energy sector reforms; developing countries; Botswana energy sector; energy security.

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For most developing countries around the world, improving the level of energy security is one of the key priorities for achieving economic growth and prosperity. However, the energy sectors of these countries are unable to facilitate the growth of the national economy as desired as they are often characterized by poor performance in meeting the high growth rates in demand and ensuring long term sustainability. Numerous scholars (*Prasad 2008, Besant-Jones and Vagliasindi, 2013, Zhang, Parker and Kirkpatrick, 2004*), have recommended restructuring the energy supply market as a fundamental step for energy sector reforms aimed at improving the performance of the energy sector in a country, balancing the gap between supply and demand, and subsequently improving the level of energy security.

Appropriately designing, planning and implementing a sequence of steps towards restructuring a power supply market leads to significant improvements in the operating performance of an energy sector. Many developing countries in Asia, Eastern Europe and Africa have over the past two decades developed liberalization policies to restructure their power supply markets in order to benefit from competition and other advantages of decreased government control and increased private sector ownership. The merit of implementing institutional reforms in the energy sector of developing countries is achieving a balance between competition, regulation and control of the strategic components of the sector.

As a typical developing country, the Republic of Botswana faces similar challenges. The energy sector in the country is underdeveloped, has poor infrastructure, low levels of rural electricity access, and supply and demand imbalance. To improve the level of energy security in Botswana, certain structural changes must be made to provide enabling conditions for the effective implementation of improvement strategies, mechanism and initiatives. To do so, the electricity supply market must undergo a restructuring reform that will dictate the new order of business in the power sector. The electricity sector in Botswana is completely dominated by state monopoly entities. The sector can be characterized as follows:

- State owned power utility Botswana Power Corporation (BPC), in charge of all electricity supply services;
- Vertically integrated supply structure (generation, transmission and distribution);
- The recent (2017) establishment of energy regulator, Botswana Energy Regulatory Authority.

The vertically integrated state monopoly utility was designed in tandem with a macroeconomic and political context that existed at the time of its inception in 1970, where both economic welfare and generation capacity size were very low and required government control as electricity was and is still regarded a public good. State coordination and management was required in order to succeed in the establishment of basic infrastructure that was necessary to support industrialization, newly open government owned diamond mines and the growing population. However, over the last decade this model of management has proven unsuccessful demonstrated by the poor performance of the sector and the continued government 'rescuing' of the public owned monopoly utility, which has been running at a loss for almost a decade (*Botswana Power Corporation, 2017*).

To achieve reliability and security of power supply, it is crucial to adopt a comprehensive power sector market reform driven by the need for new investments and modernization in the sector, in order to meet rapid growth in demand, along with the desire to protect consumers, especially the poor and to adapt to changing external factors. A power sector market reform refers to the restructuring of the power industry aimed at enhancing its performance. It involves among other processes, changes in the legislations that govern the industry, changes in ownership of certain sector entities, changes in institutional arrangements and the general organization and conduct of the electricity sector. The design of the market structure should be the starting point for the overall power sector reform. This will have a major effect on shaping all other key decisions including the design and structure of consequent contracts and decisions on pricing of services. Accordingly, market structure has a significant influence on whether and to what extent the electricity sector can achieve improvements in performance.

The major task in conducting a power market reform is ‘unbundling’ the market structure. Unbundling the power market structure refers to the separation of the three components of the power supply structure, where generation, transmission and distribution are originally vertically integrated. The objectives of unbundling and restructuring are to create an enabling environment to attract private sector participation and investment, which will take up large amounts of market risks and commitments to efficiency improvements. Transferring market risks to the private investor requires greater transparency and predictability, which are otherwise difficult to obtain in a sector with an integrated monopoly power utility. The various forms of market structure and steps of unbundling as seen in other developing countries around the world can be categorized as follows:

- Vertical integration: a vertically integrated monopolist utility. This type of market structure is historically and currently practiced in Botswana.
- Vertical integration with Independent Power Producers: A vertically integrated monopolist with independent generators that sell to it exclusively. This kind of arrangement is largely practiced in Sub-Saharan and Southern African Development Community countries such as South Africa and Namibia (*Southern African Power Pool, 2017*).
- Partial unbundling: one component of the structure separated from originally integrated structure; e.g. a combined transmission and distribution entity acting as the only wholesale single buyer from independent power producers; distribution also strictly operated by national utility. This kind of reform is mostly practiced in middle-income developing countries such as Jordan (*Komendatova, Irshaid and Marashdeh, 2017*).
- Extensive vertical (and/or horizontal) unbundling: many generation and distribution entities; a commercial transmission entity formed from unbundling the monopolist. Transmission entity acts as a single buyer of power from generators and independent power producers and sells to the distribution entities and other large consumers of power. This model is practiced mostly in upper middle class and emerging countries such as Vietnam (*Pranadi, 2018*).
- Power market: an organized market of generation entities, distribution entities and large users in which power is traded competitively, supported by a transmission entity, a power system operator and a power market administrator. This model is referred to as a liberalized power market and is practiced in the United Kingdom and European Union (*Gouardères, McWatt and Fleuret, 2018*).

Figure 1 shows the five most common steps and forms of power market structures around the world. Vertical integration is the least liberalized while Power Market is the most liberalized form of power supply market structure.

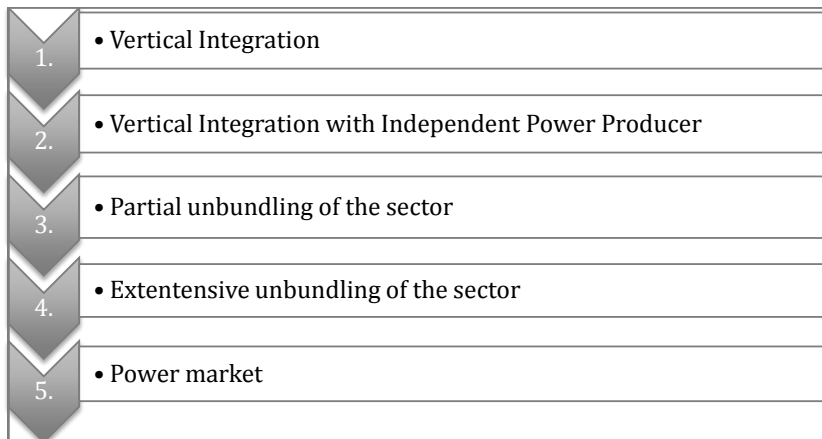


Fig. 1. Forms of Power Market Structures

The form and extend of unbundling determines the market structure. To ensure that the power supply market adequately progresses by taking the necessary steps towards a smooth transition to the next stage of market structure unbundling, a determination of the key indicators that should prompt the need for further unbundling should be made. Theoretically, the World Bank (study on policy options on the market structure in the power sector) identifies power system size and country GDP per capita as reasonable and compelling thresholds to make the case for transitioning to a more unbundled market structure. A threshold of 1000 MW and US\$1000 for system size and country GDP per capita respectively is determined for middle income developing countries to seriously consider implementing structural adjustment programs and market restructuring in the power sector. However, in the case of Botswana, which is considered an upper middle-income country with a higher GDP per capita than most countries in Sub-Saharan Africa and a power system size that is below the 1000 MW threshold (US\$ 7385 and 892 MW respectively), a suitable balance based on other indicators and national objectives should be carefully considered (*Statistics Botswana, 2018*).

Table 1 shows the key indicators that prove the low level of energy security in the country, based on the author's research and calculations (*Department of Energy, 2018; Statistics Botswana, 2018; The Global Energy Architecture Performance Index, 2017*).

Table 1

Key energy sector indicators in Botswana

Indicator	Value
Quality of electricity supply	53%
Availability of installed capacity	46%
Share of own generation in consumption	59%
Diversification of resources	30%
Energy Access	60%

As proven by the values of the listed key indicators and the recurring financial loss made by the national power utility, the performance of the energy sector in Botswana is considerably low (*Botswana Power Corporation, 2016*). Certain market structure changes should therefore be adopted to improve from this level of sectorial performance.

Based on the difference between current and desired levels of energy security indicators, decision making on the following variables that will determine the form of market structure and influence performance should be made:

- The degree of vertical unbundling: full or partial, and based on how much control the state is willing to give up. There are various degrees of unbundling: management unbundling, accounting unbundling and ownership unbundling (in order of strictness).
- The degree of disaggregation: expressed in installed capacity (MW) in the case of generation; in terms of km line length in the case of transmission; and in total retail sales (MWh) in the case of distribution. For example, 300 MW of generation capacity may be reserved for private sector production.
- The share of private sector participation: the percentage of private sector participation in terms of installed generation capacity, transmission and retail sales in distribution. For example, the state may decide to reserve 30 to 50 of its generation capacity for private sector production.
- The introduction of a regulatory agency that is credible and autonomous. Effective regulation is characterized by coherence, independence, accountability, transparency and predictability.

In comparison with other countries in the Southern African region.

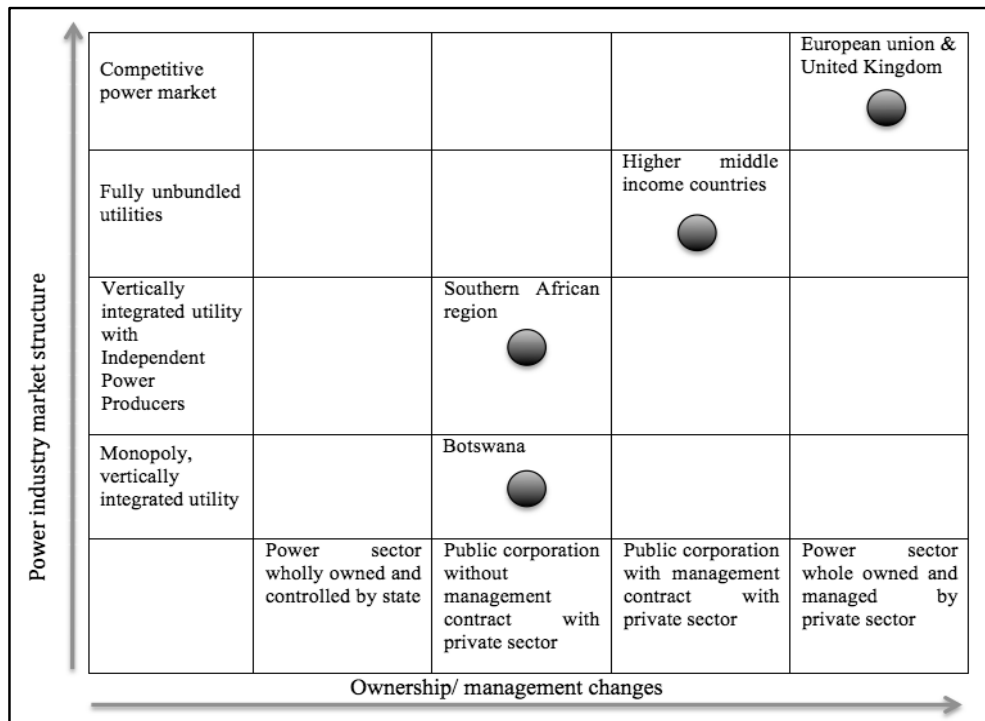


Fig. 2. A comparison of Stages of Market Structure with Other Countries

Botswana is one of the few remaining states that do not have any operating independent power producers at present. About 8 of the 12 countries in the Southern African Power Pool are at the second level of independent power producers and single buyer model and further unbundled stages. As an upper middle-income country, Botswana is also far behind compared to others at its income and Human Development Index levels. Figure 2 shows a comparison of Botswana with other world countries based on the various stages of power market structures.

The poor financial and operational performance of the monopoly utility Botswana Power Corporation makes a convincing case for restructuring, specifically in generation and in distribution. For generation, the burden of the 600 MW Morupule B power station technical challenges will continue to be an expensive liability for the government with its unreliability and high maintenance costs. Proven by this recurring high expense of maintenance, the

cost of operating the power plant is most likely to exceed the capital loan principal of US \$1.7 billion (*Botswana Power Corporation, 2010*), and recovery is far from being reached without considerable government bail. It would therefore be recommendable that the state completely privatized the generation component of power supply and invite the private sector to participate and lead in power generation in order to mitigate the current challenges in shortage of power supply and operational inefficiency, as well as to minimize future market risks. The state should therefore amend the Electricity Supply Act to provide appropriate legislature for privatization, facilitating independent power producers and the exclusion of government as a player in generation. The sale of the existing power plants assets should also be facilitated in the most beneficial manner for the state to be able to recover and settle its debt with the World Bank for the Morupule B power station. As the country's power market size is indeed smaller than many others in the region, another policy amendment should be adopted to restrict all new power plants to a manageable size of not more than 150 MW. By limiting the size of the power plants capacity, operational and technical risks can be mitigated with minimum losses. Minimizing the sizes of all future power plants will encourage the usage of multiple sources of energy in generation including renewable energy and empower multiple players in generation to encourage competition the industry. This will also promote innovation and efficiency in the industry in line with sustainable and modern trends.

In its capacity, BPC should act as the sole off taker and should maintain little or no participation in generation. Access to transmission infrastructure for generators to sell directly to end-users should at this point will remain strictly prohibited in order to protect consumers especially the poor, except for in the case of large users of power such as mines that may not be within proximity of the existing transmission network of the BPC. BPC will sign long term contracts (20 – 25 years) with independent power producers called power purchase agreements (PPAs) where the buying tariff will be agreed and terms of operations determined. It is important to carefully draft comprehensive PPAs, and preferably prudent for the government to formulate a standard format of PPA templates for consistency, depending on the source of generation used. Figure 3 demonstrates the steps for restructuring the generation component of the power market in Botswana.

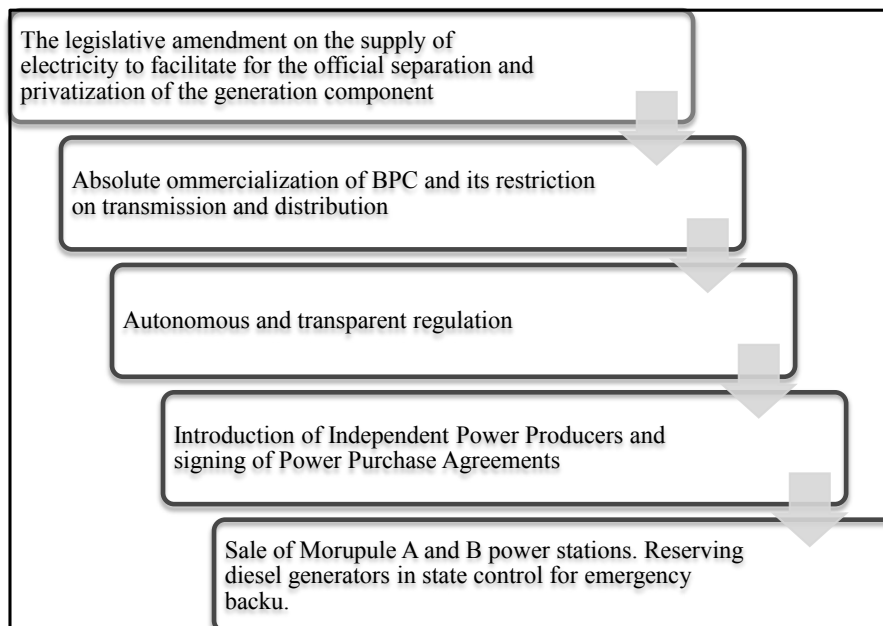


Fig. 3. Steps for Restructuring Generation Component of Power Market

A commercially oriented governance of the generation segment removes the management and development of power supply from political and bureaucratic control to achieve commercial standards in organizational practices, instil financial discipline and incentivize cost efficiency. The absolute commercialization of BPC will oblige the utility to operate based on profit-oriented and commercial principles such as meeting tax obligations, market based interest rates, market rate of return on equity and capital, and possess the autonomy to make its own business decisions as well as successfully participating and benefiting from being an active member of the regional power pool, SAPP. In terms of generation, government should retain a policy role and the Ministry of Green Technology and Energy Security should collaborate with the regulator to produce an Integrated Resource Plan that will guide the overall long-term strategies in the power sector. Integrated Resource Plan is a comprehensive decision support tool and road map for meeting the country's objectives of providing reliable and least-cost electricity service to all consumers while addressing the substantial risks and uncertainties inherent in the electricity sector. In other words, it is a means for the ministry, Botswana Power Corporation and state regulatory authority to consistently assess a variety of demand and supply resources to cost-effectively manage the sector.

In terms of distribution, adopting a partially unbundled supply market is an ideal structure that will allow for private sector participation under pre-determined conditions for corporation, to operate alongside the BPC in order to ensure generation expansion and universal access to electricity in an equitable manner. Rural electrification remains at or below 50% albeit the introduction of the National Electrification Program and Fund, which has subsidized connection fees to a standard P5600 (\$500) for residential and commercial customers. Also, the high cost of expanding the transmission infrastructure network to a countrywide scale still fails to make economic sense based on the distances, population scarcity, low retail tariff rates and the questionable affordability of some areas. Innovative solutions are needed to reach communities for which connection to the grid remains a long way off, and/or does not result in financial benefit for the BPC to transmit and distribute to. In several developing countries, distributed generation already accounts for a significant share of both generation and distribution in terms of customer coverage and retail sales. As already indicated, this business model presents an ideal opportunity for private sector participation, as financial innovation and skill is required for creating tailor made solutions where the politically driven national utility could not thrive. In this case, off-grid operators would also be allowed to distribute power in isolated settlements provided they abide by regulation guidelines including retail-pricing tariffs in line with the national stipulation to not exceed pricing thresholds. Allowing the private sector to bridge the electricity access gap removes pressure from the Botswana Power Corporation to provide an unprofitable service driven by political and not commercial incentive. Accordingly, legislative adjustments are paramount for this model of partial unbundling in order to unlock private sector investment and expertise for achieving universal access in a short space of time, and thus improving one of the performance indicators of the power sector. Figure 4 illustrates the participation of both public and private sectors in generation, transmission and distribution of electricity after supply market restructuring.

Furthermore, it is important that the regulatory body calls for a tariff reform in order to make business viable for both the private sector and the power utility. Botswana Power Corporation needs to make a profit in its service delivery for it to be able to pay the independent power producers for their constant power supply. Based on the decreasing levels of inflation (*Bank of Botswana, 2018*) and the increasing purchase power parity of Botswana, majority of Botswana Power Corporation customers could still afford electricity services after a raise in electricity tariffs. Where connected customers cannot afford the new cost of electricity, they should resort to using standalone electricity services, which would be cheaper due to the various incentives (such as duty free import of panels and equipment) provided by the government to the off grid renewable energy service providers.

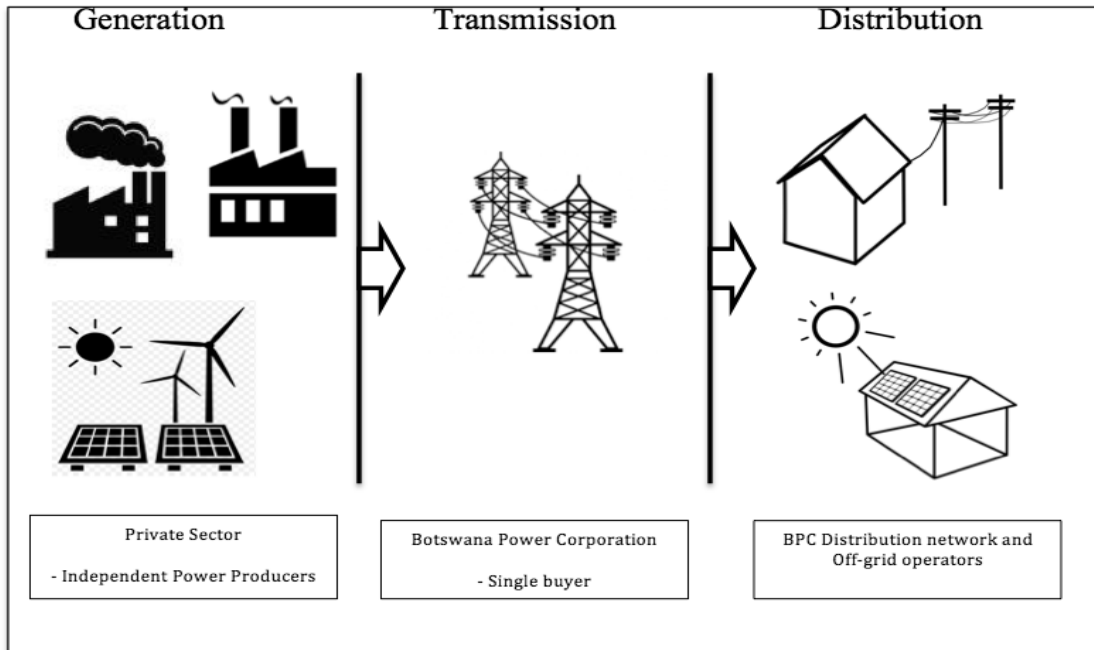


Fig. 4. Public and private sector participation after supply market restructuring

The main objective of the energy regulator is economic and legislative regulation of the electricity industry. The four main activities of energy regulation are the implementation of licensing and compliance of power producers, generation pricing and consumer tariffs, electricity infrastructure planning and overall regulatory and structural reforms in the sector (Figure 5).

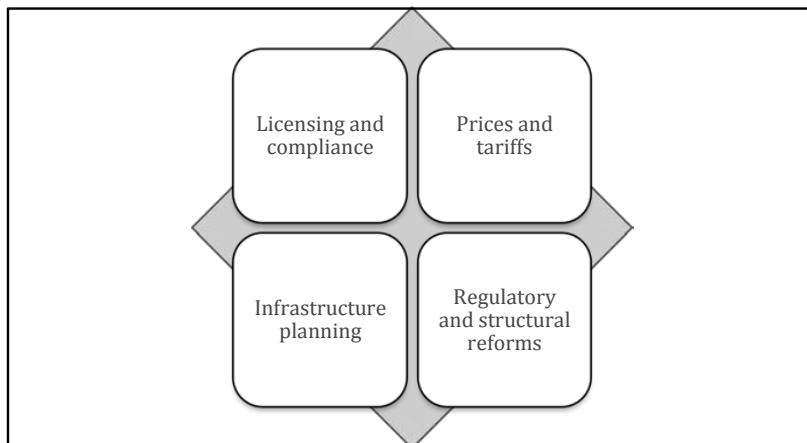


Fig. 5. The four pillars of electricity regulation

The electricity market is regulated to improve economic efficiency, law enforcement especially where competition is involved and to mitigate market failures in order to ensure that socially desirable services are provided and protected. The motives for regulation are: economic efficiency, consumer protection, environmental protection, universal access and security of supply. The regulator is mandated provide economic expert advise to the ministry on policy choices and monitor all the activities in the sector. The main pillars of the regulator should be independence, accountability, predictability and transparency. However, from the author’s research and interviews with senior officials, the government is reluctant to entirely

transfer real autonomy to the newly established Botswana Energy Regulatory Authority. International experience (Rodríguez Pardina and Schiro, 2018) shows that private investors around the world have attested to the fact that a credible regulatory system requires more than just a formally established independent regulatory entity, but also, and in particular, the need for a separate, autonomous regulatory body that operates under transparent processes. This is essential in Botswana, since the government is also highly reluctant to provide financial sovereign guarantees to international project developers and investors. Ensuring investor confidence should be a priority. This autonomy should apply to all of regulator's organizational procedures and finances, to avoid political and bureaucratic interference, and to restrict any external influence. This independence will establish a track record of stability and credibility of the regulatory authority moving forward.

The process of restructuring a power sector requires diligence and political will to ensure the successful yield of desired performance results. The transfer and sharing of control from the state to the private sector should be carefully done in order to protect state interests and marginalized populations. As such, it is important to note that the process of change should occur gradually and not abruptly. It would be highly beneficial to the Botswana government to conduct further research on the options available for improving the power sector performance and the level of energy security in the country considering its unique characteristics and long-term objectives.

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